JUNE 1968
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soil conservation

DEVOTED TO THE WISE USE OF LAND AND WATER RESOURCES

CONSERVATION FARMING WITH BIG EQUIPMENT

Parallel terraces Minimum tillage Stubble mulching

The Homer C. Mitchell Tree Farm

SOIL CONSERVATION SERVICE

U. S. DEPARTMENT OF AGRICULTURE

June 1968 Vol. 33, No. 11

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DEVOTED TO THE WISE USE OF LAND AND WATER RESOURCES

COVER: Parallel terraces in the Garza County Soil and Water Conservation District, Tex. See story on back page.

Modern . . .

Soil conservation has its modern technology, too.

Stepped-up production, made possible by fabulous advances in equipment and methods, too often brings with it stepped-up soil depletion.

But it need not. Chemicals and big machines are but tools with which the operator does his will.

If the farmer's will looks to the future, and if it is joined by understanding of sound principles of resource use, modern farming can also be conservation farming.

In our lead article this month, Engineering Director "Chet" Francis reviews some of the ways conservation technology is being shaped to the realities of modern farming.

Terraces: Conservation Engineer Tom Cowan tells (p. 248) how new type parallel terraces and modified equipment make soil and water conservation feasible in big, fast farming on the High Plains of Texas.

Tillage: Less, not more, tillage is another conservation answer to powerful machines and chemicals.

Sod- and mulch-planting of corn, as described by a team of North Carolina conservationists (p. 246), depends on a combination of chemical fertilizers and herbicides and modified equipment.

The spreading practice of stubble mulching (p. 255), too, is made feasible by modern power and plows.

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ORVILLE L. FREEMAN, Secretary of Agriculture
JOHN A. BAKER, Assistant Secretary of Agriculture
DONALD A. WILLIAMS, Administrator, Soil Conservation Service
BEN O. OSBORN, Editor
GEORGIE A. KELLER, Production Editor

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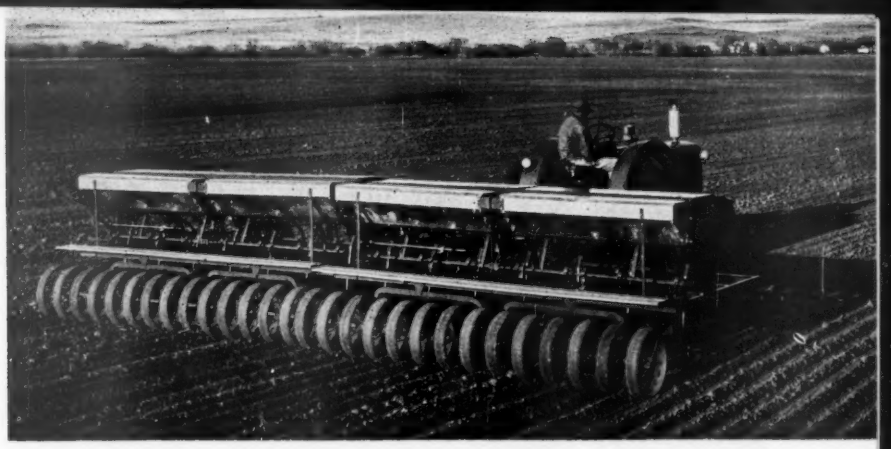


Fitting conservation to today's farming equipment

By C. J. Francis
Director, Engineering Division, SCS

The great changes in farming methods that have come about in the past decade are bringing equally great changes in conservation concepts and methods.

Probably the most spectacular change has been the development and use of larger, faster farming equipment. The high-horsepower tractor with six-, eight-, or 12-row equipment; the six- and eight-bottom plow; the combine with six- or eight-row corn headers; and the multirow, mechanical cotton picker are now commonplace.

The use of big, fast equipment, coupled with new and better seed, fertilizer, insecticides, and herbicides, enables the American farmer to produce efficiently the food and fiber needed by a growing world population.

Effects on conservation

The basic principles of conservation farming developed through research and experience are still valid with this new equipment, but changes in their application are necessary.

The large equipment demands large fields for efficient operation. Old field fences that have stood for generations are coming down. In many cases, farms are being combined to make larger operating units.

More and deeper fall plowing, possible with large equipment, leaves bare soil exposed to erosion for longer periods of time. Row cropping is becoming more intensive, leading in many instances to a continuous single cash crop, such as corn. Contrary to past thinking about rotations, new soil management systems are being devised to give good conservation results with modern farming methods.

Today's farmer is extremely sensitive to any system that slows down his operations. He avoids field layouts that add extra point rows, that cause more turning, or reduce operation speed. He frowns on arrangements that reduce the size of fields, that tend to isolate fields, or that make access and travel to and from fields more difficult.

A few computations make it easy to understand the importance of rapid movement of field equipment. An eight-row cultivator traveling at 2.5 miles an hour plows 6.6 acres an hour, while one traveling at 5.0 miles an hour plows 13.2 acres. An eight-bottom plow at 2.0 miles an hour covers 2.2 acres while one traveling 5 miles an hour covers 5.5 acres. An eight-row combine traveling 2.0 miles an hour can harvest 2.6 acres while one traveling at 3.5 miles an hour will harvest 4.6 acres. Speed and ease of operation play a big part in acceptance of a modern conservation system.

New conservation methods

Conservation methods are changing to keep pace with the trends in modern equipment. Much of the land in cultivation is steep enough to require terraces for erosion con-

Modern land-leveling equipment eliminates high and low spots in the field.

trol. Parallel terraces are at least a partial answer to the problem of conservation farming with big equipment on such fields. The terraces are fitted to the topography so that they are an equal distance apart throughout their length. The spacing between terraces is selected to fit the type of equipment used, allowing for an even number of rows between terraces and reducing the number of odd row areas. Point rows, causing extra turning in planting, cultivating, and harvesting, are reduced or eliminated.

Installation of parallel terrace systems has been simplified by the use of modern, heavy earthmoving equipment that can do necessary smoothing, cutting, and filling, to install a workable terrace system.

The size and shape of the terrace ridge also is changing. The farming equipment to be used, rather than the water-carrying capacity of the terrace, becomes the determining factor. On moderately sloping fields, the terrace ridge is made broad enough that the side slopes will accommodate the full width of the equipment to be used. The entire terrace is farmed. On steeper fields the front slope of the terrace may be made broad enough to accommodate the equipment to be used, while the downhill or backslope is made steep and is seeded to grass. Only the front slope is cultivated.

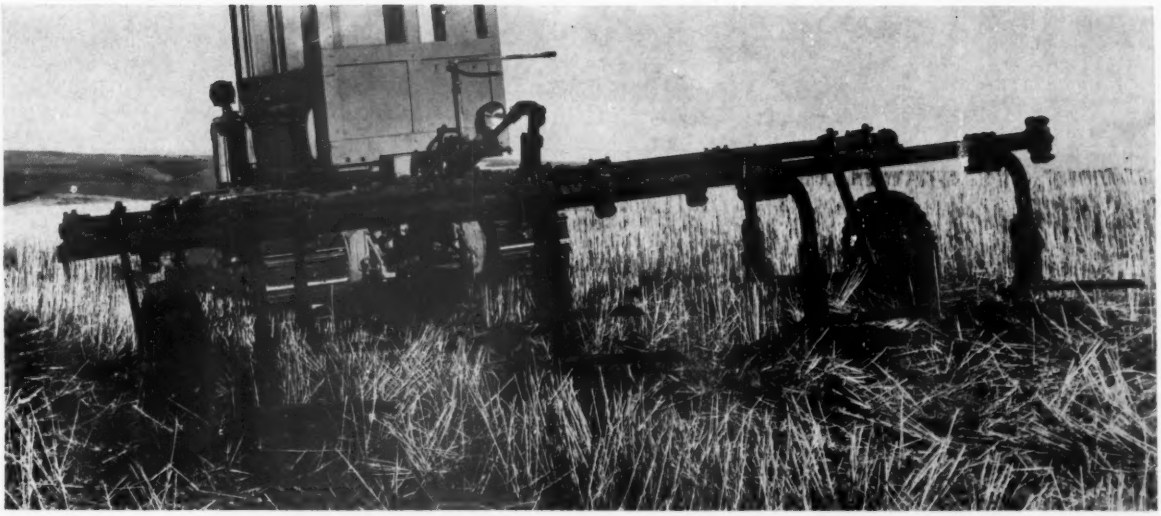
The grassed waterway, a necessary part of most upland water-disposal systems, is changing shape also. Building waterways wider and with flatter side slopes provides greater ease of crossing with large harvesting equipment, such as self-propelled combines, corn pickers, cotton harvesters, and trailers.

Special equipment plants corn in ryegrass cover and applies fertilizer in a single trip.

Underground drainage

There is a growing trend toward replacement of waterways with a buried pipe system to carry the runoff water from parallel terrace systems. The pipe in each case is of a size to carry the designed flow. An individual inlet is provided for each terrace in the system, placed in relation to the ridge to cause the least interference with operation of large farming equipment.

Access roads to and through each field are increasingly important. They must be planned as an integral part of a conservation system



Large sweep plows leave residues on the soil surface to control erosion and conserve moisture.

to provide easy access to the field, to serve as turning areas, and for use in hauling harvested crops.

Leveling and smoothing of farmland is becoming increasingly important, not only for irrigated fields and for land requiring surface drainage but for dry land as well.

Leveling or smoothing of sloping dry land may be necessary to permit installation of the best water-control system, such as parallel terraces. Elimination of high and low spots promotes uniform drying of the soil following rains or irrigation, gives uniform conditions for cultivating, and provides easier and quicker access for harvesting. These things become increasingly important as equipment becomes larger.

Minimum tillage

More intensive farming and greater reliance on continuous single cash crops can increase the erosion hazards. Careful planning for best use of crop residue is essential to reduce exposing bare soil and to maintain soil organic matter and soil tilth. Reducing the number of plowing operations and doing tillage operations in a manner to leave crop residue in or on the surface can greatly reduce the erosion hazard.

In some parts of the Southeast, corn and soybeans are planted directly in a sod cover. The sod, usually fescue or ryegrass, is killed with a herbicide. A special planter opens a narrow trench in the dead sod and puts down fertilizer and seed with little disturbance of the cover. Need for cultivation is eliminated or reduced by use of herbicides. The sod residue reduces soil temperatures in summer, acts as a soil mulch to reduce moisture losses, and provides excellent protection for the soil from erosion.

In other parts of the country, plowing, planting, and cultivating are done with modern equipment in a way to leave large amounts of residues from cash crops, such as corn, on the surface to provide similar protection.

Modern equipment is now available for growing crops with a minimum of tillage. The soil is worked and fertilized, herbicides are applied, and seed is planted in one trip over the field. Minimum tillage reduces soil compaction, aids increased water infiltration, and reduces erosion.

As farming equipment grows larger and more complex, conservation systems are being adapted to meet the changing needs. ♦

Sod-planted corn matures a crop with the soil surface still densely covered.

Progress in minimum tillage

North Carolina farmers adapt machinery and methods to gain advantages of sod and mulch planting

By W. W. Stevens, C. C. Abernathy, and J. E. Pollock
State soil conservationist and conservation agronomists, SCS, Raleigh, N. C.

Many North Carolina farmers and others interested in soil and water conservation are coming to prefer sod or mulch planting to conventional tillage where these minimum tillage operations can be adapted to their cropping systems.

Sod or mulch planting leaves a protective cover of living sod or residue on the soil surface during the growing season. This conserves moisture, increases water infiltration, reduces soil loss from water and wind, reduces soil compaction, and reduces cost of production.

A trial first

Equipment and techniques should be tested on a small scale, however, before large scale plantings are attempted. The results are variable.

Sod planting refers to planting corn and similar crops in perennial sods. Mulch planting refers to the same crop planted in residue and stubble of annual crops. The same equipment is generally used for both types of planting.

Satisfactory yields of corn and sorghum for grain and silage can be produced in perennial cool-season sod without destroying the sod. Trials indicate that turning annual plant residue into the soil is not necessary to make satisfactory corn yields. Furthermore, sod planting of corn is much better in cool-season perennial sods that have at least a partial dormant period when corn is making its maximum growth. Plants like fescue, orchardgrass, and bluegrass meet this requirement and can be readily suppressed with herbicides. Perennial grasses should be mowed or grazed closely before planting corn by this method.

Plants like bermudagrass, dallisgrass, and johnsongrass have the same peak growth period as corn. They give serious competition to sod-planted crops and are hard to suppress or kill with herbicides without injury to the planted corp.

Residue or stubble from corn, soybeans, and small grains offer little or no competition to the mulch-planted crops. Herbicides, however, need to be used to control the annual summer grasses and weeds.

	1962	1963	1964	1965	1966	1967
Number of plantings	1	3	16	57	69	90
Acres planted	10	30	69	290	722	1,000
Counties with plantings	1	3	14	38	43	49

Sod planting in North Carolina

In North Carolina the acreage of corn planted in perennial sod has rapidly increased, as these figures show:

Production costs for sod-planted corn are $10 to $14 an acre less than those for conventionally planted corn. Variation in cost is

Soil loss was near zero, far left, and corn came up within a week when planted in a cool-season perennial grass. Herbicides suppressed sod and annual grasses. Above, corn planted in rye treated with a herbicide and fertilizer but with no land preparation. On right, sod-planted corn grows in recovered fescue for third year after producing 20 tons of silage an acre the first 2 years.

due to different methods of planting, fertilizing, and use of herbicides. Much of the profit of growing corn in North Carolina may result from this saving in production costs.

Any sturdy equipment that will plant at the proper depth, cover properly, and firm soil around the seed is satisfactory for sod or mulch planting.

Farmers have generally modified equipment they have on their farms; a few have designed and built their own equipment.

The modifications usually consist of adding a chisel, bull tongue, or point 1 to 2 inches wide to a shank or tine and attaching this to a tool bar to prepare a planting area in front of a conventional planter. The shanks or tines on field cultivators or similar equipment are often rearranged to prepare the planting area at the desired row width. Most farmers use a rolling coulter in front of these openers in heavy sod or residue.

Some farmers use subsoil points, cultivator sweeps, grassland drills or sod seeders, or power-driven, heavy-duty rotary tillers. All of the blades are removed except for two or three at the desired row width. Some farmers use a rolling coulter or subsoil points ahead of this equipment.

Some farmers use a seed press wheel in the planting furrow just behind the seed boot and in front of the conventional press wheel. They report excellent stands of crops.

In one operation

Some farmers prepare the planting area, apply the fertilizer, and plant the seed in one operation. Others prepare the area for planting, apply fertilizer, and plant in separate operations. The fertilizer is applied in the drill, in bands, or broadcast with no significant differences in yield.

Experience, observations, and research point to several conclusions about sod and mulch planting:

(1) Satisfactory results depend upon adequate moisture; proper use of fertilizer, usually including a sidedressing of nitrogen; proper use of herbicides; and proper planting procedures.

(2) Some land unsuited for row-crop production under conventional methods can be used for annual grain and silage crops with sod planting.

(3) Sod planting in perennials is an excellent conservation measure, but it also presents new problems such as control of insects, diseases, and nematodes.

Successful sod and mulch plantings have been made in all regions of the State. They have been successful, both in production and conservation, on many soil types. There is no known reason why they cannot be successful on any good soil. ♦

A flexible tool bar allows this eight-row planter to plant four rows on the side of a parallel terrace while planting four rows on the terrace interval.

Changing terrace styles adapt to modern equipment

By Thomas E. Cowan
Agricultural engineer, SCS, Lubbock, Tex.

On the Texas High Plains, large-scale farming has many of the answers to labor shortages and high operating costs. These answers, however, may raise new questions on applying soil and water conservation measures. Four-row machinery is being replaced by six-, eight-, and even 12-row equipment, and this calls for a reevaluation of terracing methods among other conservation measures.

Standard terrace systems that followed the natural slope of the land were satisfactory for four-row farming. Rows were laid out parallel to terraces with the point rows placed near the center of the intervals or at the low side of the terraces. The turning space required for farming the point rows was not large, but as equipment increased in size, so did the size of the turnrows. With the larger equipment, too much land had to be left out of crops, and turning was difficult.

Parallel terraces

These problems are partially solved by constructing parallel terraces that eliminate or reduce point rows. This is done by landforming along the terraces and in the intervals between them. A minimum number of irregular shaped terrace intervals result. Irregular intervals can be planted to drilled crops or grass, or farmed with smaller equipment.

Fitting large equipment to the terrace ridge is still a problem. Ridge type terraces that are common on the High Plains are 12 inches or more high and 20 to 25 feet wide. Since the standard furrow width is 40 inches, or 3⅓ feet, four-row equipment is about 13 feet wide. This is close enough to the width of one side of the terrace ridge to permit the terrace to be worked without any problems. But six-row equipment is about 20 feet wide, or nearly as wide as the entire terrace ridge. Farming one side of a terrace at a time places two rows off the terrace ridge.

A logical question is why not make the terrace ridges wider? A

Terrace spacing is important where the land is bedded with a five-bottom middle buster, then planted and cultivated with six-row equipment.

little thought shows that this would be impractical. For six-row equipment, a 40-foot base width would be needed. Such terraces would cover too much of the total field area; on some slopes, half the field area would be in terraces.

Two sizes of equipment

The usual solution is to farm the area between terraces with six- and eight-row equipment, and then use four-row equipment on the terraces, or leave the terrace ridges out of row-crop production. This is convenient where crop acreage restrictions are being observed.

But keeping a small tractor just to farm terraces is not the final answer. Some farmers are modifying their large equipment to farm the terrace ridge. One approach is to break the tool bar in the center. An eight-row hookup will permit operating four bottoms on one side of the terrace ridge and the other four in the terrace interval. There is still the problem of designing machinery that can be picked up for turning and also maintaining strength and rigidity with the flexible tool bar.

Terrace spacing is another point that needs consideration. The old terrace vertical interval formula is still important for conserving soil and water, but the number or rows between terraces must be adjusted to fit farming equipment. If the field is bedded with a five-row lister, then planted and cultivated with six-row equipment, the number of rows per terrace interval must be considered carefully. If six-row equipment is to be used in the terrace interval and four-row equipment on the terrace ridge, a different terrace spacing will be needed. The terrace spacing on all fields must be worked out for the equipment and farming procedures that each farmer plans to use on his farm.

In this way, conservation measures will stay in harmony with progressive farming methods and changing equipment. ♦

A report from Tunisia . . .

SCS conservationist finds water and grass regarded as gifts from God

Durwood E. Ball went back to his regular job as range conservationist for SCS at Uvalde, Tex., November 1967, after 2 years in Tunisia. Under a Participating Agency Service Agreement (PASA) among USDA, AID, and the Tunisian Government, Ball was range conservationist for the Oued Marguellil Watershed Project.

In Tunisia he helped establish a 600-acre demonstration pasture and the El Grine Nursery, a 247-acre seed production center. He directed the planting of 54 species of grasses and legumes from which plants will be selected and produced for a range management program he outlined for the project area.

The nursery is irrigated and ready to contribute valuable seed to the local farmers.

What was *their* reaction?

Ball met the people, saw many reactions, and came home feeling optimistic of the nursery's success.

In Tunisia, he said he felt more optimistic in the winter, when most of the 8 to 15-inch annual rainfall came to the region between Maktar and Kairouan. In the summer, during the "sirocco," or desert wind, he understood why the people there revered water as "God given."

Save the water

They would plug the drawdown spillway on a watershed dam, not understanding that the pipe was needed during the rainy season to keep a constant water level behind the dam. At first, it seemed to Ball, the fear that water would

A native vetch is a center of attention for Durwood Ball at El Grine Nursery where 54 species of legumes and grasses were tested for possible use in local range improvement.

escape and go to waste made some Tunisians so uncomfortable they felt compelled to plug the pipe with rocks.

Finally, a nearby farmer indicated his change in thinking by tipping off the SCS people when he knew someone had stopped the spillway.

The first to come when water gathered behind a completed dam, he recalled, were the kids. They jumped in and splashed joyously. Then the women came with their water jugs to fill and clothes to wash. Finally, the animals—donkeys, sheep, cows, and camels—came to drink.

Grass too, is "God given," he learned from the Tunisians. It grows when there is moisture, turns brown and dies when it's dry, and miraculously returns again with the rain.

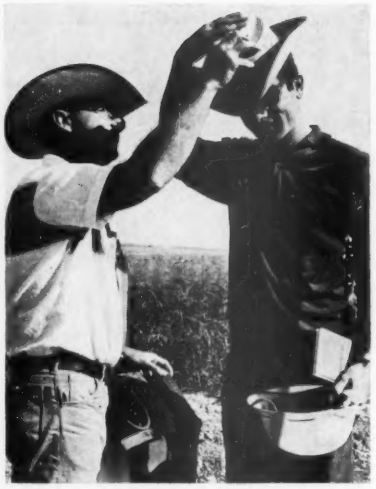
Use the grass

Before men trained in plant materials work came to Tunisia, the native herdsmen did not regard pasture as a crop but that grass was meant to be used when and where it was offered. They were not allowed to graze wheat and other grain.

As head of range and plant materials work in the Oued Marguellil Watershed Project, Ball's job was to convince farmers that grass was a crop—that plants could be selected and planted to improve grazing on their dry rangeland.

When an irrigation well was dug for the El Grine Nursery, people came from nearby villages to see the "new water." They filled their water jugs and watered their donkeys.

Along with the seed-producing plants came the weeds. The nursery was not equipped with modern herbicides to spray the 100 hectare (247-acre) nursery. But the women from the villages solved the problem. They came and pulled the weeds, stacked them in piles, and carried them home to feed their livestock.



SCS Range Conservationist Durwood Ball (left) tops off his Tunisian assignment with the gift of a Texas hat to Mohamed Gahrbi, a trainee at the seed production center.

On weekends Ball traveled with his wife and four children to Tunis, where he wrote reports and met with Government officials.

As he watched the donkeys drink from the fountain in the street and the sheep graze on his front lawn, he realized the value of exposing his family to this ancient culture. His children learned a new language, tasted different foods, and discovered people as people without culture-bound prejudice.

Clash of ideas

Tunisia is a traditional country clashing against an influx of modern ideas. Ball, as a proponent of the modern, said he was accepted with reservation in some cases and openly in others.

At a rug auction in Tunis, he won the bid on a rug when he raised the bid 40 cents. When Ball tried to pick up the rug, the rug carrier withheld it, insisting Ball was not a merchant, but a tourist. There is another market for tourists with tourists' prices. Finally, the woman who made the rug approved the deal.

While in the field, Ball saw a large caravan pitching tents for the evening. It was moving sheep from summer grazing in the mountains down to the plains for the winter. Ball was warmly greeted by the chief and allowed to take pictures throughout the camp. He photographed a woman holding a baby which clearly showed the scratch marks where the child was bled for fever. Arabic authorities rarely allow their women to be photographed, much less with a baby.

Ball thanked the chief and invited him to stop again in the spring when he returned to the mountains. The chief's reply was characteristic: "Inshallah" (God willing).

Farming methods that have supported centuries of survival are hard to change, Ball discovered. The farmer who has plowed with a camel for many years finds it hard to realize that tractors need maintenance and repair.

A long walk to work

Although workers saw little more than futility in hurrying, reported Ball, each morning they walked 10 miles from their village to the camp at Maktar and 3 more miles to work on a nearby project. In the evening, they walked the 13 miles again to reach their village.

Many Tunisians are willing to work for a daily wage of 60 cents and 3 pounds of flour. There is a shortage of jobs. The shiek, or head of the community, selects the workers from the many who apply.

Tunisia is a relatively progressive nation, and the people appreciate the chance to learn. The workers gave a party for Ball at the center before he left. It was a hearty affair with barbecued sheep, bread and wine, and the singing of many Tunisian songs.

Ball gave his top Tunisian trainee at the center a Texas hat. Mohamed Gahrbi was overwhelmed. The man who had the know-how to grow new grass on the parched plains had given him a prestigious symbol that few Tunisians would fail to envy. ♦

A more-than-man-sized plow does a man-sized job of breaking up hardpans and subsoil on a California irrigated farm.

Slip plows used to break up hardpans in irrigated soils

Landowners in Imperial and Coachella valleys in California are using slip plows to improve soil permeability in fields with plowsoles, hardpans, and stratified soils. Slip plowing increases soil drainage and aids in the removal of harmful salts from irrigated cropland.

The slip plow is a modification of the deep subsoiler and consists, basically, of a single heavy-shanked chisel, capable of working to depths of 6 feet. To this is attached a reinforced flat plate, 10 to 14 inches wide and 12 to 14 feet long.

The plate, oriented with its long dimension in the direction of travel, is attached to the pointed end of the chisel shank and extends upward and backward at an angle of 60 to 70 degrees. The upper end of the flat plate has a delta wing flare to push loose soil away from the space opened by the plate.

The upper end rides near the ground surface when in operation, and a stabilizer chain or metal bar holds the upper end of the attachment in position. The angle of the plate can be controlled by the length of the stabilizer. Dimensions vary among the numerous homemade implements as well as custom and commercial models in use.

As the slip plow moves through the soil it breaks up the stratification by lifting, rolling, and mixing the soil in the disturbed area.

Slip plowing is done on 4- or 8-foot intervals across the field. The job requires track-type tractors of about 200 drawbar horsepower. Depending on soil type and depth of plowing, they are used singly or in tandem.

After slip plowing, leach water is applied to move salts out of the soil and into the drainage system. The practice is not recommended unless there is adequate provision for drainage.

Costs average $16 an acre for plowing on 8-foot intervals, and $32 an acre on 4-foot intervals.

Russell Rummonds, president of the Coachella Valley Soil Conservation District, and his brother, Ray, one of the directors of the Coachella Valley County Water District, used slip plowing on a 40-acre field of stratified Indio silt loam at their farm in Thermal.

Soil samples tested after leaching with 2 feet of water showed that salts in the top 24 inches of soil were reduced to electrical conductivity readings of 1.6 to 4.2 millimhos per cubic centimeter. Readings of 7 to 35 millimhos were found in similar samples taken from the nonplowed areas 4 feet away. The field was reclaimed after slip plowing the undisturbed area and leaching with an additional 3 acre-feet of water per acre.

—Walter A. Bunter, Jr., and Jack F. Smith, *work unit conservationists, SCS, Coachella and El Centro, Calif.* ♦

GRASSED WATERWAYS

Grassed waterways are broad gently sloping channels that carry water slowly and safely off the field. They are covered with a thick grass that keeps the water from cutting into the soil. ♦

The D+X formula at home . . .

The Homer C. Mitchell Tree Farm

By Ed Kerr
Public Law Land Review Commission, Washington, D. C.

Many of the precepts of the late SCS woodland conservationist, Homer C. Mitchell, are demonstrated on the memorial forest near Flatwoods, La., dedicated to his memory.

The Homer C. Mitchell Tree Farm, an impressive 90,000-acre reforestation project of T. L. James & Company, was established largely under the direction of Don Burkhalter, an early protege of Mitchell when both were employed by the Soil Conservation Service.

Now 10 years old, the young trees are large enough for application of the "D plus X" formula of spacing which was one of Mitchell's main contributions to the art of forest management. This simple guide to improvement cutting relates the diameter of trees in the stand to the space required for proper growth.

It is one of the four steps in the principles of woodland conservation that Mitchell advocated. The total concept is to:

(1) Prevent wildfires.

(2) Plant areas that won't become naturally stocked within 2 years.

(3) Thin according to plan. Leave the best trees to grow, spaced at a distance determined by the diameter of the trees plus a constant appropriate to each species (D+6 for Southern pines).

(4) Harvest crop trees at the rate of 1 per acre per year in addition to the trees cut in thinning, opening areas at least 100 feet across.

The James tract is probably the largest in the world managed according to the formula.

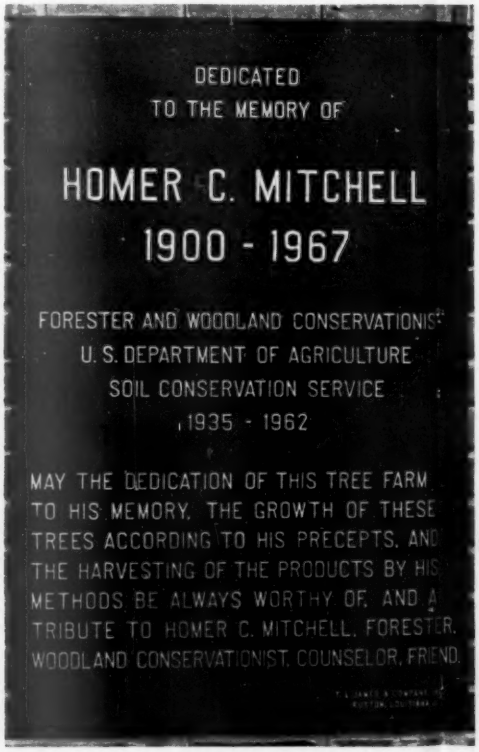
It was about 10 years ago that the James Company embarked on a reforestation project that promised more hurdles than an Olympic arena. Namely:

(1) The land is situated in five central Louisiana parishes which once bore the worst forest-fire record in the Nation. Local residents burned the cutover pinelands every year to "green up" the grass before spring.

(2) The 90,000-acre tract was almost devoid of trees, yet the company had signed a 99-year lease agreement with the owner which called for payments of more than $1 an acre a year, plus taxes and other expenses. This meant the company had to reforest not only skillfully but fast!

(3) The only possible way to reforest an area of that size in limited

Company employee covers trash at a designated waste-disposal area on the reforestation project.


DEDICATED
TO THE MEMORY OF
HOMER C. MITCHELL
1900 - 1967
FORESTER AND WOODLAND CONSERVATIONIST
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
1935 - 1962
MAY THE DEDICATION OF THIS TREE FARM
TO HIS MEMORY, THE GROWTH OF THESE
TREES ACCORDING TO HIS PRECEPTS, AND
THE HARVESTING OF THE PRODUCTS BY HIS
METHODS BE ALWAYS WORTHY OF, AND A
TRIBUTE TO HOMER C. MITCHELL, FORESTER,
WOODLAND CONSERVATIONIST, COUNSELOR, FRIEND.

Hunters and other recreationists are invited to see the reforested land.

time was direct-seeding; that is, dropping pine seed directly onto prepared ground, instead of employing the time-honored method of transplanting 1-year-old nursery stock. Direct-seeding techniques, developed by researchers of the U. S. Forest Service 3 years before, had been tested on small, pilot-plant acreages but never before on large projects. Would it work?

(4) In a community of rural residents accustomed to setting range fires and raising wild hogs and open-range cattle, reforestation can mean a revolution in a way of life. It can also mean counter-revolution.

Today, the T. L. James tract is a forest 40 feet tall—one of the most fabulous success stories in the history of Southern forestry. Burkhalter, forest manager for the company, calls it a "monument to coordinated public service."

The forest-fire record on James' holdings, which have been phenomenally low, is attributed to cooperation by the Louisiana Forestry Commission and community goodwill. Before the James project was begun, the entire area burned over every other year. Since that time, fire loss has been cut to an average of 200 acres a year, or less than 0.2 percent of the total acreage. This is one-fourth the Southern average.

When Burkhalter first gathered his employees together, preparatory to the first-year reforestation effort,

A company forester has a neighborly visit with a resident of the area.

he explained his philosophy of community relations very clearly:

"Being a good neighbor means just that. If one of our neighbors needs to go to a hospital, take him there in a company vehicle and your time will be counted as company time. If I hear that you don't take him, you'll be dismissed."

As a result, James employees, most of whom were chosen from the local area as a matter of company policy, have become well-known as good neighbors in the Flatwoods community.

"Employees representing most of the communities within the property boundaries have been local goodwill ambassadors," according to Bill Evans, chief forester for the James tract. "They have no doubt sold the reforestation program to some individuals who could not have been favorably influenced by anyone else."

Immediately upon leasing the property, Burkhalter placed the entire acreage under soil conservation district agreement and availed himself of the services open to him.

"We wanted technical assistance, and we got it from SCS personnel through the district," he pointed out. "Soil scientists were requested to locate a suitable site for a community lake to provide needed recreational facilities in the way of swimming, boating, camping, and fishing for the vast area. They found a 54-acre site, and engineers prepared the necessary plans and specifications for the dam and supervised its construction. Biologists made recommendations for stocking and fertilizing the lake, and we followed their advice precisely."

This was only the beginning. Cattlemen soon found out that the company policy was not to restrict use of the range to them, although the company would not tolerate wildfires.

Garbage disposal is always a problem in rural areas. Knowing this, the company dug garbage pits and maintained them for all local communities.

A program was begun to grant subleases to high schools for 40-acre school forests.

Building sites were granted to church congregations.

A wildlife propagation program was developed to increase quail, deer, wild turkey, and squirrels, with the cooperation of the Louisiana Wildlife and Fisheries Commission. The commission also provided fingerlings for stocking the community lake. Food and cover plants were grown in the company's nursery at Ruston to stock the acreage.

From a study of SCS soil maps, the company selected a block of land to be planted in soybeans. This crop will provide a source of income while the young trees are growing large enough for the first harvest.

"Here the county agents and Extension Service specialists from Louisiana State University were called upon for assistance," Burkhalter said. "They collected soil samples, tested them, and made specific recommendations on fertilizer and trace element requirements, coupled with cultural practices to be followed."

Burkhalter pays special tribute to the U. S. Forest Service "without whose know-how and assistance in direct-seeding the project would not have been possible in the first place." With the help and advice of Bill Mann, project leader, and the staff of the Alexandria Forestry Center at Pineville, La., the entire acreage was reforested successfully in 3 years.

Burkhalter is managing the entire 90,000 acres according to the late conservationist's principles. He has completed steps one (protection) and two (planting). Soon he will begin steps three and four. Young trees will be thinned to the D+6 spacing every 6 years. The harvesting will not be the one crop tree per acre per year that Mitchell prescribed as a simple method of area control for small timber tracts but will still follow his principle of systematically harvesting and replanting a definite area each year. The planning for this phase of the operation is not yet final. A 35-year rotation is being considered, which would require the annual harvesting of about 2,500 acres of timber.

And last, but not least, Burkhalter attributes the success of the James project to Homer Mitchell, for whom the tree farm is named. ♦

Workers trained for jobs created by RC&D Project

More than 160 jobless Oklahomans—many of them Cherokee Indians—are being trained for new jobs being created in the Cherokee Hills Resource Conservation and Development Project.

In a special $300,000 training program funded by the Labor Department, the people are learning attitudes and skills needed for jobs in operating and repairing construction equipment, welding, doing land-improvement work, and other specialized jobs, from typing to poultry processing. The training grant will grow to $1.5 million as the program proves its worth and other courses are added.

It is a pioneering cooperative effort by USDA, Labor, and the Department of Health, Education, and Welfare. Aim is to ready local citizens for new jobs in rural America as they're brought about by efforts such as RC&D projects.

An early measure in the Cherokee Hills Project proved that training works. In the Bull Hollow Training Course, 15 unemployed Cherokee Indians learned how to operate construction equipment. On the same day that they "graduated," 14 of them got jobs.

More and more trained workers will be needed as the RC&D Project moves along. The 23 measures completed last year alone are expected to bring 500 man-years of continuing annual employment, and to increase gross income in the area by $3.5 million. ♦

The three-blade flexible sweep is favored for use on terraced land.

Stubble mulching moves east to play dual role in wind and water erosion control

By Earl J. Bondy
Conservation agronomist, SCS, Salina, Kans.

Stubble mulching is taking on new momentum as a soil conservation practice of wide application. Long ago it proved effective in controlling wind erosion on cropland in the western Great Plains and Far West. Now it is moving east and proving equally useful in dealing with water erosion.

Wheat growers in central Kansas, along the eastern edge of the Great Plains, are successfully adapting the practice to play a dual role in their conservation programs.

These farmers generally grow continous wheat, without a year of fallow between crops, because they expect more precipitation than growers farther west do. Until 10 to 15 years ago, most central Kansas wheat farmers grew sweet clover about 1 year in 4 on their wheatland. The sweet clover provided nitrogen, organic matter, and good soil tilth. It helped hold moisture, aerate the soil, and control soil erosion.

But times have changed. Few wheat growers in central Kansas now raise a legume crop. They moved rapidly toward more intensive row-crop farming when they found that nitrogen could be obtained at less cost from chemical fertilizers. Wheat acreage allotments also encourage intensive cropping.

Take the case of Matthew Heigele, Clay County, who has terraced all of his cropland and farms on the contour. These measures simply weren't doing the job well enough with his farming program of wheat, grain sorghum, and soybeans.

Central Kansas receives an average of 27 to 30 inches of precipitation a year, compared to 20 inches and less in western counties. The rainfall is unevenly distributed during the year and sometimes causes severe water erosion. In addition, the upland soil blows readily in dry weather.

"Several years ago, I decided to try stubble mulching. Today, I am a strong believer in it. It has filled the gap in wind- and water-erosion control and moisture conservation," he said.

Heigele's wheat yields at least as much as when he used a moldboard plow. As soon as wheat is harvested, he goes over the stubble with a 7½-foot blade sweep that undercuts the stubble and weeds at a depth of 4 inches to get a good weed kill. He usually repeats the operation four times before planting wheat. He varies the depth of undercutting to avoid forming a hardpan. Each plowing reduces stubble on the surface by about 10 percent. When he has too much stubble left, he disks some of it under.

Five hundred to 1,000 pounds of stubble an acre, along with other conservation measures, protects the soil from erosion. In central Kansas, silty clay loam and silt loam soils require at least 500 pounds of residue an acre for small grains;

fine sandy loam twice that much. Double these amounts are needed for sorghum or corn.

Heigele says there is no "right" number of times to go over the ground between harvest and planting. The most important purpose of sweep tillage is to control weeds; it should not be done more often than necessary.

Heigele uses a 10-inch 14-hole hoe drill because it drills better through heavy residues than a 7- or 8-inch drill.

Ken Portenier, who farms with his father-in-law, Eugene Sanford, in Cloud County, reports that he has benefited from stubble mulching on upland wheatland over the last 3 years. Some of his land is vulnerable to wind erosion.

"Little soil blowing occurred in the 1966–67 drought, where it blew badly in the droughts of the 1930's and the 1950's," Portenier said. "Water erosion also is controlled by stubble mulching." The Cloud County partners, like Heigele, found that terracing and contour farming weren't enough.

Subsoil moisture

"Stubble mulching made a big difference in subsoil moisture," noted Wilbur Naylor, SCS work unit conservationist at Concordia. "In late winter, we dug down 32 inches in a stubble-mulched field and still found subsoil moisture. Other fields in the county that weren't stubble mulched had moisture down only a foot."

Portenier and Sanford use a three-section flexible sweep to undercut the stubble. Each blade works independently, thus avoiding damage to terraces. Stubble mulching saves time, labor, and fuel, compared to moldboard plowing. The amount of savings depends on how wet the soil is and how many times it is necessary to go over the ground to control weeds.

Brothers Clarence and Frank Garten, Dickinson County, find the same type of sweep best suited for their farm.

Matthew Heigele shows the residue left on the soil surface between the rows of the succeeding crop of wheat.

Another strong advocate of stubble mulching is Clinton Lundquist, chairman of the McPherson County Soil Conservation District and a former SCS work unit conservationist. As a farmer, he has had 10 years of experience with stubble mulching wheat on upland and wheat and corn on bottom land. He uses a spiketooth harrow behind his double-mounted 30-inch sweeps. The harrow kills weeds and nearly all volunteer wheat and smoothes and spreads the stubble. Sometimes if the ground is hard right after harvest, he goes over it with a chisel.

Keep soil covered

Lundquist thinks in terms of keeping the soil covered. This in combination with terracing controls erosion well on his farm.

Larry Blythe, Morris County, is another veteran stubble mulcher. He figures he reduces the cost in time and fuel by one-fourth by using the three-blade sweep instead of moldboard plowing wheat and soybean stubble.

"Wind erosion was bad last March, but I undercut bean ground and it held," he said. He seldom does his tillage exactly the same way twice, indicating that what works one time may not work the next. Proper stubble mulch management depends on considering all soil, weather, and crop conditions, and these vary with time and place.

Many farmers in Saline County lost much of their 1967 wheat crop during the winter drought, but Byrne Kelley saved nearly all of his by undercutting the old stubble once and mulch treading four times in the summer of 1966. The mulch left on the surface not only protected the soil from blowing but helped conserve the few inches of precipitation that the farm received between the 1966 harvest and the 1967 growing season.

In the spring of 1967, Kelley was able to sink a steel rod 2 to 3 feet deep in a stubble-mulched field; but in a field that had not been stubble mulched, he could push the rod down only 1 to 2 feet. Deep undercutting first, followed by shallow treading, gives him the best results.

"Stubble mulched ground retains water. I can put on more fertilizer and raise my best wheat in wet years," he said. "This water-holding capacity bothers some wheat growers who are anxious to get wheat planted during a wet fall. But fall weather doesn't stay wet very long. Farmers have until December to plant wheat in this area. Some think they have to plant wheat early to control erosion and to provide wheat pasture. But, stubble mulching controls erosion, and late planting gets away from the Hessian fly problem."

These and other farmers' experiences in central Kansas indicate that stubble mulching is successfully moving eastward from the 20-inch rainfall area (where it controls wind erosion and conserves soil moisture) to the 27- to 30-inch area (where it also stops water erosion). ♦

"Mr. Coastal Bermuda," District Supervisor J. R. Davis, with one of the bales of hay that added up to 2½ tons to the acre in one cutting. The pickup baler takes up the windrow of cured grass and ties it into round bales dropped behind the machine.

District supervisor solves his forage problem and gets a custom business

"Mr. Coastal Bermuda." That's what they call Jesse Davis around the Winston County Soil and Water Conservation District in Alabama. Davis is a supervisor of the district.

Davis picked up that name 4 years ago when he, his wife, Jewell, and their son, Virgil, were struggling to produce forage for 83 cows on 200 acres of land. As often happens, they had the cows but not enough grass.

The most promising pasture was a 10-acre field of Coastal bermudagrass planted with sprigs the year before. After consulting with the local SCS soil conservationist, Davis bought a bermuda digger and planter. In the spring of 1963, he planted 90 acres of grass.

Then a new door of opportunity opened. His original plan was to plant grass on his own farm, then sell the planting equipment.

"But people kept after us to plant grass for them," Davis explained. "So we decided to give custom-planting a try."

In 1965, the Davises custom-planted about 100 acres, in addition to planting another 15 to 20 acres of their own. They dug sprigs from their farm for all of the plantings.

Before 1964, SCS workers, extension agents, and other technicians could get only 20 to 30 acres of Coastal bermudagrass planted in the county each year. In 1966,

thanks largely to the extra boost from the Davises, more than eight times that much was planted.

District Supervisor Davis now has the grazing and forage situation well in hand for the first time on his home farm. His 120 acres of Coastal bermudagrass and 80 acres of fescue-white clover keep his 120 cows in prime condition.

Davis takes full advantage of help from the Soil Conservation Service, Agricultural Stabilization and Conservation Service, and Extension Service.

Last season Davis sold about 5,000 bales of hay and put more than 14,000 bales in his barn. One barn still had 3,000 bales left over from the 1966 season. The Davises are glad to sell hay instead of buying it, as they did just three winters ago. With a total of 17,000 bales stored at the beginning of this winter, Davis' cows will not go hungry.

An interesting sidelight to the new situation on the Davis farm is that they can now plant fescue and white clover and keep a stand. Before the Coastal bermudagrass days, they couldn't let the grass develop a stand before grazing it. His cows now graze Coastal in the summer in preference to fescue. At the end of December animals grazing the fescue-clover pastures were still largely ignoring the hay racks.—BYRON M. OLIVER, *work unit conservationist, SCS, Double Springs, Ala.* ♦

Boy Scouts collect soil samples as part of their work in earning the merit badge in soil and water conservation.

Conservation badges earned by Scouts

Conservation is a big word to the Boy Scouts of America. This is especially true for those Scouts who must earn merit badges in either soil and water conservation or conservation of natural resources before they can become Eagle Scouts, the highest rank.

As early as 1965, several Scouts began working on their soil and water conservation badges on the watershed of White River Lake, site of the District Camporee, in the Rio Blanco Soil and Water Conservation District, Texas.

Under the guidance of the Soil Conservation Service, they built a brush dam to stop a gully, studied conservation for wildlife, and learned some basic points about range conservation.

The Scouts saw a waterway being constructed and used engineering equipment to check it for proper construction. They learned that the waterway as designed would handle water during rains without gullying and would serve as an outlet for future terraces.

They studied different soil types: Referring to SCS soil maps, they dug holes to examine soil profiles; took samples of five different soil types; and made a display of them. They also made a field trip to study irrigation systems and the need for conserving scarce irrigation water.

At the troop court of honor, two of the boys demonstrated soil and water conservation to the rest of the troop by using small models of fields to show how plant cover reduces runoff and prevents erosion. —ROBERT M. KRAL, *work unit conservationist, SCS, Crosbyton, Tex.* ♦

The two-row sprig planter covers 5 to 7 acres a day.

Water-supply outlook favorable in West

Water supply for irrigation and other purposes will be satisfactory this season in most areas of the West, according to the Water Supply Outlook for Western United States, based on April 1 snow survey data compiled by the Soil Conservation Service.

Prospects of streamflow from snowmelt are highly varied, according to the report. As of April 1, parts of Oregon and Southwest Idaho faced water shortages. And there may be a water shortage along the Arkansas in Colorado and western Kansas and the Rio Grande through New Mexico. On the other extreme, in Arizona surface supplies will be much above average.

The outlook for California is for adequate water supply to meet most demands this spring and summer. ♦

Larry Amaya feeds a mixture of farm-produced hay to his farm flock and shows the quality of his new fence.

On the way to a dream fulfilled

Desire and hard work are turning 240 acres of irrigated land into a dream farm for the Larry Amayas near Monte Vista, Colo. And a Soil Conservation Service Great Plains Conservation Program contract developed through the Rio Grande Soil Conservation District is helping make it possible.

Dream comes true

Less than 5 years ago Larry Amaya, a young, hard-working individual of Latin American descent, worked as a farm laborer in the South Plains of Texas. For years he and his wife Sandra dreamed of owning their own farm. In the fall of 1963, they found such a farm near Monte Vista.

The Amayas made an $8,000 down payment saved by growing 15 acres of cotton and 10 acres of maize for several years and arranged the rest of the financing through the Federal Land Bank.

They and their five children moved to their new farm in 1965. The house was not modern, so Larry arranged for financing through the Production Credit Association and built a new house. He also drilled a new domestic artesian well.

Amaya soon realized that although the soils on his farm were good, he would need to level and revamp his irrigation system and acquire more water because the canal water sometimes ran out before the end of the growing season.

After several visits with an SCS conservationist, he made a plan and signed a Great Plains Conservation Program contract through the Rio Grande District. Amaya drilled his first irrigation well in the spring of 1966, a second in 1967, and completed a 315-foot artesian well for stockwater that serves two 40-acre pastures. Together the two irrigation wells pump 2,400 gallons a minute.

Practices conservation

In the spring of 1967, he leveled 80 acres of irrigated land and seeded it to a mixture of alfalfa and bromegrass. Amaya's overall plan calls for seeding the entire 240 acres of land in 3 or 4 years.

"We are planning for a flock of 300 ewes," Amaya says.

To date, he has completed four-fifths of a mile of new interior fence to aid in pasture and hayland management, and he plans to build another ½ mile. The fences are scheduled for cost-sharing under the Great Plains Conservation Program.

The Amayas have also built a new 64- x 32-foot lambing shed and a new set of sheep corrals to serve the 300 ewes they plan to lamb each year. They have constructed a mile of new exterior boundary fence and have also improved the premises.

Plans for future

When visiting with the Amayas, you get the feeling they will make it on their own and that they will reach the goals they have set. Some of these are to get the oldest son, Larry, Jr., in college in the fall of 1969 and lay the groundwork for educating the other children.

"We will rent 40 to 100 acres of land to grow potatoes," Larry says, "and maybe someday we will grow some spuds at home. But right now, I want to build up the soil for top production to finance my children's college education."—DONALD A. Moss, *work unit conservationist, SCS, Monte Vista, Colo.* ♦

Meetings . . .

Editors and broadcasters discuss modern farming

Two organizations of agricultural communicators with a record of strong support to soil and water conservation are meeting this month. They are the American Agricultural Editors Association with 280 members and the National Association of Farm Broadcasters with 480 members. The AAEA is holding its summer meeting in Minneapolis, Minn., June 16–19; and the NAFB in Denver, Colo., June 30–July 3.

Both meetings will feature a variety of presentations aimed at bringing members up-to-date information on modern farming and agricultural communications.

The purpose of the AAEA, headed this year by Claude W. Gifford of *Farm Journal,* is to provide for and encourage a free exchange of ideas among editors and writers in the areas of farm production technology, marketing, and farm policy.

The purpose of the NAFB is to promote better and more successful farm broadcasting in service to agriculture and rural living. President this year is Keith Kirkpatrick of station WHO, Des Moines, Iowa. In both organizations are nonvoting members from industry, agribusiness, educational groups, and government.

Architects' conference on man and nature

The American Institute of Architects is holding its annual meeting this year in Portland, Oreg., and in Honolulu, Hawaii. The major part of the conference will be in Portland, Oreg., on June 23–26. On July 28 and 29 the conference will reconvene in Honolulu, Hawaii.

The theme for this year's conference is "Man—Architecture and Nature." The keynote speaker on Wednesday, June 26, will be Mrs. Lyndon B. Johnson. Secretary Orville Freeman will chair a discussion during the conference with Dr. M. Gordon Wolman of Johns Hopkins University and Mr. Marvin B. Durning, a Seattle, Wash., attorney, as panel members. Numerous workshop discussions related to the conference theme will be held in connection with the annual conference.

Sanitarians plan research on environmental health

The annual meeting of the National Association of Sanitarians will be held in Washington, D. C., on June 23–27. More than 2,000 people are expected to participate. The main theme of the conference is program planning on research and environmental health.

Numerous topics dealing with liquid and solid waste disposal, water pollution, and other health problems will be discussed.

The National Association of Sanitarians strives for recognition of the sanitarian as a professional by establishing and promoting qualifications on education, experience, and on ethics.

Dates and places

June 2–7, American Water Works Association, Cleveland, Ohio.

4–7, National Rivers and Harbors Congress, Washington, D. C.

9–12, American Seed Trade Association, Chicago, Ill.

9–14, General Federation of Women's Clubs, Boston, Mass.

15–22, Outdoor Writers Association of America, Inc., Gardens, Ga.

19–21, American Society of Agricultural Engineers, Logan, Utah.

23–27, National Association of Sanitarians, Washington, D. C.

23–26, American Institute of Architects, Portland, Oreg.

28–29, American Institute of Architects reconvenes in Honolulu, Hawaii.

30–July 2, Newspaper Farm Editors of America, Denver, Colo.

30–July 5, National Education Association, Dallas, Tex.

July

13–17, American Association of Nurserymen, St. Louis, Mo.

21–25, Business and Professional Women's Club, Minneapolis, Minn.

28–31, National Association of County Government Officials, Washington, D. C.

Review

Agriculture and the Quality of Our Environment. EDITED BY NYLE C. BRADY. *1967. Amer. Assoc. Adv. Sci. Publ. 85. Washington, D. C. 460 pp. $13.50.*

Forty-three contributors, 10 of them from the U. S. Department of Agriculture, furnished the contents of the four sections of this report of a symposium at the annual AAAS meeting in December 1966.

The sections cover (1) Agriculture and Air Quality, (2) Agriculture and Water Quality, (3) Soil Pollution in Agriculture, and (4) Human and Animal Wastes.

The opening chapter on air pollution describes impacts on agriculture, noting that some of the damaging air pollutants arise from agriculture itself. Dusts, smokes, and odors are probably the most widespread of these; but pesticides, reactive organic vapors, and oxides of nitrogen from burning wastes are significant. Damages to crops and livestock are increasing, and establishment of air quality standards is timely.

The introductory chapter on water quality concludes with the note that the solution to pollution in rural areas as well as in cities is likely to be waste-water reuse. Agricultural processing wastes are cited as a significant source of pollution. Sediment and its control are included; and it is pointed out that control at source provides the most satisfactory solution to the problem. Salinity and dissolved solids pollution are also considered. Of particular significance to agriculture and forestry is the proposal of the "living filter" sewage disposal system which uses crop- and forest-land surfaces.

Soil pollution derives from radioactive substances, fertilizers, pesticides, and metals. Strontium-90 is observed to be caught and bound in the top 8 inches of soil, so that

it may be concentrated by erosion and redeposition. Cesium-137 behaves similarly.

Radionuclide pollution of soil is not considered to present any significant health hazard. Nitrogen in rural water supplies is attributed to natural sources, fertilizers, and domestic wastes; in some areas it has built up to hazardous levels.

Pesticide pollution of soils involves both the older metallic poisons and the more recent halogenated hydrocarbons of which DDT is most widespread. Copper, zinc, mercury, and lead are cited as the most significant metal pollutants of the soil; they may originate from fertilizers and pesticides, from wastes, or from fallout of air pollutants.

The final section brings up one of the most significant, yet newest of pollution problems: animal wastes. Domestic wastes in rural areas, waste characteristics, hazards, and disposal methods are discussed first, followed by four chapters on different animal wastes. These wastes are reported to equal in volume 10 times that of the human population of the country and contribute to air pollution, water pollution, nuisances, and disease. Drainage and runoff from feedlots where wastes are concentrated are cited as particularly important.

This book will be a much-used reference for a long time.—W. E. BULLARD, JR., *Resource Development Division, SCS, Washington, D. C.*

Soil, Water and Suburbia. *1968. USDA and U. S. Dept. of Housing and Urban Development. 160 pp., illus. $1.25.*

The proceedings of the Conference on Soil, Water, and Suburbia, held under the joint sponsorship of the two departments in Washington, D.C., June 15–16, 1967, provides a handsome showcase for the papers and related discussion on the problems of land in transition as communities grow.

Participants in the conference, by necessity limited to 500, undoubtedly will find in this report a renewal of the stimulation they felt in hearing authorities diagnose and prescribe for the many ills of the expanding cities of America. Others—public officials, community planners, engineers, developers, financiers—who deal with the problems of resources under the pressures of more and more people will find a compelling source of excitement and information.

The illustrations alone, gathered by the editors with obvious care and considerable effort, merit study.

Secretary of Agriculture Orville L. Freeman, an opening speaker in the conference, observed: "Suburbia, which most assuredly is land in transition, is something new in America. It isn't rural—it isn't urban. Yet it's both. And because it is neither and yet both, it's apt to be a kind of no man's land where development is too often thoughtless, unplanned, and uncontrolled."

And Secretary Robert C. Weaver of the Department of Housing and Urban Development, added: ". . . We cannot let haphazard development shape our lives. We must use our great resources and technology to make the land and our cities serve the people. Now is the time to develop an urban land policy and an urban conservation ethic comparable to the policy we now follow on farm and forest."

Even those concerned with the tribulations of the inner city will find in this compilation much food for munching as they plan.—T. A. JENKINS, *Information Division, SCS, Washington, D. C.*

Conservation Education: A Selected Bibliography. BY JOAN CARVAJAL AND MARTHA E. MUNZER. *1968. Interstate Printers and Publishers, Danville, Ill. (for Conservation Education Association). 98 pp.; paper. $2.50.*

The Conservation Education Association in this booklet provides a much-needed survey of recent books in the broad field of resource conservation that should be equally useful to educators, conservationists, and concerned citizens. The selections seem to have been made objectively, the comments are informative, and the coverage of the diverse subject matter is well balanced.

The project was supported by a grant from the Conservation Foundation. This bibliography is a sequel to one published in 1955 covering the period 1938–55. It is the fourth in a series of educational aids by CEA under the title "Education. . .Key to Conservation."

The philosophy expressed in the introductory sections and evident in the selections is in harmony with that of the Soil Conservation Service; i.e., that all resources are interrelated and that all fields of knowledge must be considered in their management and conservation.

The book is dedicated "to the memory of Robert L. Brown, State conservationist for Hawaii," with this notation: "When the Conservation Education Association started its work on this project, Bob Brown was completing a conservation bibliography for the schools of Hawaii. His untimely death has deprived us of his generous offer of assistance." Even without his help, the result surely would have pleased Bob Brown.

The subject matter is organized under four general headings: Interrelationship of resources (i.e., ecology), natural resources (air, water, plants, etc.), role of man (conservation, quality of environment, social implications, population, planning), and tools for teachers.

The booklet has the limitations that apply to any "selected" bibliography. They are acknowledged by CEA President Wilson F. Clark in the foreword: "A bibliography is a strange kind of publication. It never satisfies its audience; it goes out of date as it goes to press, and it is never as complete as one would like."

Any well-informed conservationist probably would have made other selections, especially in the field of his specialty. Almost anyone might have included other titles in the "basic collections" recommended for initial conservation libraries for early elementary, middle grades, high schools, and teachers and group leaders with budget limitations of $25, $50, $100, and $150. Nevertheless, the lists offered will be useful to people confronted with making such selection.—B.O.

New publications

Proceedings, Texas Conference on Soil, Water, and Suburbia. *(1968). USDA Soil Conservation Service, Temple, Tex. 89 pp.*

Pains and cures connected with a rapidly changing America—those examined and discussed in the national conference in Washington, D. C.—were brought to narrower focus in a Texas conference on Soil, Water, and Suburbia in Austin, October 25 and 26, 1967.

Among highlights recorded in the published proceedings are the presentations by a group of San Antonio officials who described in detail the use by their city of Federal assistance in planning for a San Antonio of 50 years hence.

America's Changing Environment. By Various Authors. *1967. Daedalus 96 (4): 1003-1225. Fall issue. Single copy $2.00 from American Academy of Arts and Sciences, 280 Newton Street, Brookline Station, Boston, Mass. 02146.* This issue of the journal of the academy is devoted entirely to a series of thoughtful and informative papers on problems of environmental quality. The authors are well-known authorities in the fields of ecology, landscape architecture, and resource management.

Soil and America's Future. *(1968). Soil Conservation Society of America, Ankeny, Ohio. 236 pp., illus. $5.00.* Proceedings of the 22d annual meeting of SCSA, Des Moines, Iowa, August 13-16, 1967. Panel subjects are: Soil and America's Future; Land Management for Tomorrow's Agriculture; Resource Conservation Problems and Progress; Sediment and Nitrates in Soil and Water Management; Soil Erosion Problems and Controls; Resource Conservation through Education; Managing the Environment for Quality Living; Land Use and Soil Surveys.

Technical Action Panels. *1968. USDA PA-850. 4 pp. leaflet.* Rural areas development and outreach functions of the county boards composed of representatives of USDA agencies in each.

Forests and Wildlife. By U. S. Forest Service. *Rev. 1967. USDA Conservation Teaching Aid FS-37. 4 pp., illus.* A basic statement about wildlife in the national forests, prepared especially for use by students but informative for the general public.

Questions and Answers on the Golden Eagle Passport and Other Federal Outdoor Recreation Fees. *1968. U.S. Dept. Interior, Bur. Outdoor Recreation. (12 pp.).*

Financing Home Purchases and Home Improvements. *1967. U. S. Dept. Housing and Urban Development HUD IP-31. 15 pp., illus. $0.10.*

Soil surveys

Pulaski County, Indiana. By Sidney Pilgrim. *1968. 84 pp., illus.; maps 4 inches to the mile (1:15,840).* Fieldwork by R. Bell, P. Edmonds, K. Huffman, G. Preston, A. Zachary, and D. Post.

Columbiana County, Ohio. By Heber D. Lessig, William F. Hale, and J. Leslie Yohn. *1968. 132 pp., illus.; maps 4 inches to the mile (1:15,840).*

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Sherburne County, Minnesota. By M. F. Grimes. *1968. 81 pp., illus.; maps 4 inches to the mile (1:15,840).* Field survey by M. F. Grimes, M. G. Ziebell, C. K. Sutton, L. M. Chamberlain, and E. Meir.

Stark County, North Dakota. By Kermit E. Larson, A. F. Bahr, William Freymiller, Richard Kukowski, Donald Opdahl, Howard Stoner, Paul K. Weiser, Donald Patterson, and Ordell Olson. *1968. 116 pp., illus.; maps 3.17 inches to the mile (1:20,000).*

Giles County, Tennessee. By J. C. True, J. F. Campbell, E. P. Davis, and D. L. Montgomery. *1968. 69 pp., illus.; maps 4 inches to the mile (1:15, 840).*

AMERICA THE BEAUTIFUL COLOR LITHOGRAPHS

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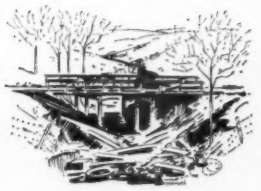
From the Administrator:

What Are We Doing to Our Environment?



Our changing country has changing needs. We have been so busy growing, developing, and exploiting that we haven't taken time to assess what we were doing to our country and to ourselves. Suddenly, now, some major—and disastrous—situations are forcing themselves to our attention.

Where is the bountiful supply of clean sparkling water? Where is the clean fresh air to breathe? Where is the scenic beauty of an uncluttered landscape framed in a clean blue sky? What have we lost?

Quality of environment is what we have lost—are still losing.

In recent years, the Soil Conservation Service has been giving increasing attention to the "amenities" of the rural landscape along with the factors that affect the productive potential of the land. It has encouraged and assisted land owners and users to develop outdoor recreation facilities, to preserve and enhance natural beauty, and to provide habitat for wildlife.

Now, the Secretary of Agriculture has issued an official directive (Secretary's Memo. 1631) making the enhancement of the quality of the environment a basic policy of the Department.

"The Department, in cooperation with other agencies, is committed to improving, protecting, and restoring environmental values in the face of unprecedented demands being made on these values by modern society. Degradation of the environment, either rural or urban, can harm man, and other plant and animal life," the memorandum says.

Quality of environment is a concept difficult to define, for it depends much on individual preferences and evaluations. In the Secretary's memorandum, environment means simply "living conditions for people." Thus, the total landscape—not, as originally, just the problems of soil erosion and runoff—becomes the concern of the Soil Conservation Service.

One of the biggest environmental problems we face is that of reducing damages and losses from pollution of soil, water, and air by agricultural chemicals, crop and livestock wastes, sediment, sewage, mineralized drainage, garbage, and litter. We suffer from a tremendous disregard toward wastefulness.

The different kinds of wastes often have interrelated effects. Most of the principal kinds of pollutants *are* wastes, or are associated with wastes.

Sediment, itself, is the most widespread and significant pollutant in water. In addition, pesticides and plant nutrients may be carried by sediment. The interaction of these substances in damaging environment is related to agriculture. Some come from agriculture; all may do harm there. Four billion tons of sediment move into streams each year, more than half of it coming from crop and range and forest lands.

Air pollution from industrial operations and use of fossil fuels cause half a billion dollars damage to agriculture each year. And 30 million tons of natural dusts derived from soil blowing from cultivated fields and deteriorated rangelands and from highway and construction sites also cause great damage.

Plant nutrients come from sewage from animal manures and from runoff and seepage from land. They may result in unwanted growths of aquatic plants that lead to unpleasant tastes and odors and may even become toxic. Waste production from domestic animals in the United States is close to 2 billion tons a year, and half of it is produced in concentrated supply.

Millions of tons of sulfuric acid from coal mines pour into our rivers in the East; while in the West, equal amounts of inorganic salts from geologic deposits or accumulations in arid lands are washed into the streams by natural percolation and irrigation return flows.

Twenty-five million tons of slashings are left each year by logging, a reservoir for tree diseases and insects and a serious fire hazard. Forest fires each year produce more than 30 million tons of smoke particles and more than 330,000 tons of volatile hydrocarbons.

Some 470 million pounds of pesticides are used annually on about 80 million acres of land. Although generally useful and necessary to agricultural production, some may cause damage beyond their targets, are slow to break down in nature, and are carried into water.

Our policy is to prevent, or to control as far as possible, these threats to environment. We want to control them at their source, before any damage occurs; and where we can, avoid them by finding better ways to operate.

We expect to enhance our total environment, as directed by the Secretary, to improve the attractiveness of rural living, to expand outdoor recreation, and to protect public health as well.

All this means new and broader programs, in which we will take part, toward providing and maintaining a healthy, attractive, prosperous, and vigorous environment for all Americans. To prepare ourselves for this new outlook and work, we must consider in detail the problems we will face and be ready to cope with them armed with all pertinent available information.

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Parallel terraces on the High Plains

Parallel terraces on the Gerald Norman farm southwest of Post, Tex., in the Garza County Soil and Water Conservation District, enable the farmer to use large row-crop equipment efficiently.

In the large field in the foreground, only one odd-shaped area between terraces and a triangular corner interrupt the full-length rows. These areas are planted to sown crops.

The widths of the terrace ridges and of the intervals between are calculated to accommodate a feasible number of "passes" of the equipment being used.

The terraces were constructed with cost-sharing from the Great Plains Conservation Program and technical assistance from the Soil Conservation Service, both made available through the conservation district. ♦